Algebra 1 Chapter 10 Review

Multiple Choice
Identify the choice that best completes the statement or answers the question.

Simplify the radical expression.

____ 1. \(\sqrt{144}\)
   a. 12         b. 12\(\sqrt{2}\)         c. 6         d. 4\(\sqrt{6}\)

Simplify the radical expression by rationalizing the denominator.

____ 2. \(\frac{4}{\sqrt{21}}\)
   a. \(\frac{4\sqrt{21}}{21}\)         b. 4\(\sqrt{21}\)         c. 21\(\sqrt{4}\)         d. \(\frac{\sqrt{441}}{21}\)

____ 3. A square garden plot has an area of 24 ft\(^2\).
   a. Find the length of each side in simplest radical form.
   b. Calculate the length of each side to the nearest tenth of a foot.
      a. \(\frac{\sqrt{24}}{2}\); 2.45 ft          c. \(\frac{24}{4}\); 6 ft
      b. 2\(\sqrt{6}\); 4.9 ft          d. \(\sqrt{24}\); 5 ft

Find the length of the missing side. If necessary, round to the nearest tenth.

____ 4.

\[
\begin{align*}
5 & \quad c \\
14 &
\end{align*}
\]

a. 361          b. 19          c. 38          d. 14.9

Determine whether the given lengths can be sides of a right triangle.

____ 5. 18 m, 24 m, 30 m
   a. no                     b. yes

____ 6. 7 cm, 40 cm, 41 cm
   a. no                     b. yes
Determine whether the following statement is sometimes, always, or never true.

7. Two consecutive positive integers form part of a Pythagorean triple.
   a. never  b. always  c. sometimes

Simplify the expression.

8. \(\sqrt{6} + 2\sqrt{6}\)
   a. \(3\sqrt{6}\)  b. \(-\sqrt{6}\)  c. \(3\sqrt{12}\)  d. \(-\sqrt{12}\)

9. \(4\sqrt{7} + 8\sqrt{63}\)
   a. \(76\sqrt{7}\)  b. \(12\sqrt{63}\)  c. \(28\sqrt{7}\)  d. \(28\sqrt{63}\)

10. \((6 - \sqrt{11})(6 + \sqrt{11})\)
    a. \(36 + \sqrt{11}\)  c. \(-85\)
    b. \(47 + 12\sqrt{11}\)  d. 25

11. \(\frac{8}{\sqrt{6} - \sqrt{3}}\)
    a. \(8\sqrt{6} - 8\sqrt{3}\)  c. \(\frac{8\sqrt{6} + 8\sqrt{3}}{27}\)
    b. \(\frac{8}{\sqrt{6} + \sqrt{3}}\)  d. \(\frac{8\sqrt{6} + 8\sqrt{3}}{3}\)

12. \(\frac{\sqrt{2} + \sqrt{6}}{\sqrt{8} + \sqrt{6}}\)
    a. \(\frac{\sqrt{12} + 6 - \sqrt{16} - \sqrt{48}}{-2}\)  c. \(\frac{\sqrt{8}}{\sqrt{14}}\)
    b. \(\sqrt{3} - 1\)  d. \(\frac{1}{\sqrt{4}} + 1\)

13. Find an exact solution for \(\frac{\sqrt{5} - 1}{x} = \frac{\sqrt{5}}{2}\). Then find the approximate solution to the nearest tenth.
    a. \(\frac{10 - 2\sqrt{5}}{5}; 1.1\)  c. \(-2; -2\)
    b. \(2 - 2\sqrt{5}; -2.5\)  d. \(\frac{2\sqrt{5} - 2}{\sqrt{5}}; 1.1\)

14. The formula \(r = \sqrt{\frac{A}{P}} - 1\) gives the interest rate \(r\) that will allow principal \(P\) to grow into amount \(A\) in two years, if the interest is compounded annually. Suppose you have $425 to deposit into an account. Find the interest rate you would need to have $470 in the account at the end of the second year.
    a. 5.2%  b. 105%  c. 0.052%  d. 5.4%
15. Find the exact perimeter of the triangle.

\[ \text{a. } 68 \sqrt{x} \quad \text{b. } \sqrt{68x} \quad \text{c. } 5x + x \sqrt{17} \quad \text{d. } 68x \]

Solve the equation. Check your solution.

16. \[ 4 = \sqrt{m} - 8 \]

\[ \text{a. } 6 \quad \text{b. } 144 \quad \text{c. } 2\sqrt{3} \quad \text{d. } 12 \]

17. \[ \sqrt{r+5} = 11 \]

\[ \text{a. } 126 \quad \text{b. } 6 \quad \text{c. } 17 \quad \text{d. } 116 \]

18. The velocity of sound in air is given by the equation \( v = 20 \sqrt{273 + t} \) where \( v \) is the velocity in meters per second and \( t \) is the temperature in degrees Celsius. Find the temperature when the velocity of sound in air is 369 meters per second. Round to the nearest degree.

\[ \text{a. } 507^\circ \quad \text{b. } 6,535^\circ \quad \text{c. } 7,081^\circ \quad \text{d. } 67^\circ \]

Solve the equation. Identify any extraneous solutions.

19. \[ w = \sqrt{7w} \]

\[ \text{a. } 0 \text{ and } 7 \text{ are solutions of the original equation.} \]
\[ \text{b. } 0 \text{ is a solution of the original equation. } 7 \text{ is an extraneous solution.} \]
\[ \text{c. } 7 \text{ is a solution of the original equation. } 0 \text{ is an extraneous solution.} \]
\[ \text{d. } -7 \text{ is a solution of the original equation. } 0 \text{ is an extraneous solution.} \]

20. The formula \( v = \sqrt{64h} \) can be used to find the velocity \( v \) in feet per second of an object that has fallen \( h \) feet. Find the velocity of an object that has fallen 25 feet. Round your answer to the nearest hundredth.

\[ \text{a. } 800 \text{ feet per second} \quad \text{c. } 200 \text{ feet per second} \]
\[ \text{b. } 320 \text{ feet per second} \quad \text{d. } 40 \text{ feet per second} \]
21. Graph the function $f(x) = -4 \sqrt{x}$.

   a.
   b.
   c.
   d.

   Short Answer

22. The sales of a certain product after an initial release can be found by the equation $s = 16 \sqrt{3t} + 25$, where $s$ represents the total sales (in thousands) and $t$ represents the time in weeks after release.

   a. Make a table of values.
   b. Graph the function.
   c. Use the graph to estimate the sales 7 weeks after release.
Essay

23. In the diagram \( y = \sqrt{17} \). Use the Pythagorean Theorem to find \( x \). Express \( x \) as a radical expression in simplest form. Show your work.

24. Simplify \( \left(2 \sqrt{5} + 3 \sqrt{7}\right)^2 \). Show your work. Justify each step.

25. Solve \( \sqrt{3x} - 1 = -4 \). Check your solution. If there is no solution, write \textit{no solution}. Show your work.
MULTIPLE CHOICE

1. **ANS:** A    **PTS:** 1    **DIF:** L2    **REF:** 10-1 Simplifying Radicals
   **OBJ:** 10-1.1 Simplifying Radical Expressions Involving Products
   **STA:** CA A1 2.0    **TOP:** 10-1 Example 1
   **KEY:** radical expressions | Multiplication Property of Square Roots | square root

2. **ANS:** A    **PTS:** 1    **DIF:** L2    **REF:** 10-1 Simplifying Radicals
   **OBJ:** 10-1.2 Simplifying Radical Expressions Involving Quotients
   **STA:** CA A1 2.0    **TOP:** 10-1 Example 7
   **KEY:** radical expressions | rationalize | radicand in the denominator

3. **ANS:** B    **PTS:** 1    **DIF:** L3    **REF:** 10-1 Simplifying Radicals
   **OBJ:** 10-1.1 Simplifying Radical Expressions Involving Products
   **STA:** CA A1 2.0    **TOP:** 10-1 Example 3
   **KEY:** word problem | problem solving | radical expressions | multi-part question

4. **ANS:** D    **PTS:** 1    **DIF:** L2    **REF:** 10-2 The Pythagorean Theorem
   **OBJ:** 10-2.1 Solving Problems Using the Pythagorean Theorem
   **STA:** CA A1 2.0 | CA A1 24.2    **TOP:** 10-2 Example 1
   **KEY:** Pythagorean Theorem | right triangle

5. **ANS:** B    **PTS:** 1    **DIF:** L2    **REF:** 10-2 The Pythagorean Theorem
   **OBJ:** 10-2.2 Identifying Right Triangles
   **STA:** CA A1 2.0 | CA A1 24.2    **TOP:** 10-2 Example 3
   **KEY:** right triangle | converse of the Pythagorean Theorem | converse | Pythagorean Theorem

6. **ANS:** A    **PTS:** 1    **DIF:** L2    **REF:** 10-2 The Pythagorean Theorem
   **OBJ:** 10-2.2 Identifying Right Triangles
   **STA:** CA A1 2.0 | CA A1 24.2    **TOP:** 10-2 Example 3
   **KEY:** right triangle | converse of the Pythagorean Theorem | converse | Pythagorean Theorem

7. **ANS:** C    **PTS:** 1    **DIF:** L3    **REF:** 10-2 The Pythagorean Theorem
   **OBJ:** 10-2.1 Solving Problems Using the Pythagorean Theorem
   **STA:** CA A1 2.0 | CA A1 24.2
   **KEY:** always sometimes never | Pythagorean Theorem | Pythagorean triple | reasoning

8. **ANS:** A    **PTS:** 1    **DIF:** L2    **REF:** 10-3 Operations With Radical Expressions
   **OBJ:** 10-3.1 Simplifying Sums and Differences
   **STA:** CA A1 2.0 | CA A1 25.0    **TOP:** 10-3 Example 1
   **KEY:** like radicals | combining like radicals

9. **ANS:** C    **PTS:** 1    **DIF:** L2    **REF:** 10-3 Operations With Radical Expressions
   **OBJ:** 10-3.1 Simplifying Sums and Differences
   **STA:** CA A1 2.0 | CA A1 25.0    **TOP:** 10-3 Example 2
   **KEY:** like radicals | combining like radicals | radical expressions

10. **ANS:** D    **PTS:** 1    **DIF:** L2    **REF:** 10-3 Operations With Radical Expressions
    **OBJ:** 10-3.2 Simplifying Products and Quotients
    **STA:** CA A1 2.0 | CA A1 25.0    **TOP:** 10-3 Example 4
    **KEY:** FOIL | radical expressions | Multiplication Property of Square Roots
11. ANS: D  PTS: 1  DIF: L3  REF: 10-3 Operations With Radical Expressions  
OBJ: 10-3.2 Simplifying Products and Quotients  STA: CA A1 2.0 | CA A1 25.0  
TOP: 10-3 Example 5  KEY: radical expressions | rationalize | conjugates

12. ANS: B  PTS: 1  DIF: L3  REF: 10-3 Operations With Radical Expressions  
OBJ: 10-3.2 Simplifying Products and Quotients  STA: CA A1 2.0 | CA A1 25.0  
TOP: 10-3 Example 5  KEY: conjugates | radical expressions | FOIL | rationalize

13. ANS: A  PTS: 1  DIF: L2  REF: 10-3 Operations With Radical Expressions  
OBJ: 10-3.2 Simplifying Products and Quotients  STA: CA A1 2.0 | CA A1 25.0  
TOP: 10-3 Example 6  KEY: radical expressions | rationalize | radical equation | Multiplication Property of Square Roots

14. ANS: A  PTS: 1  DIF: L3  REF: 10-3 Operations With Radical Expressions  
OBJ: 10-3.2 Simplifying Products and Quotients  STA: CA A1 2.0 | CA A1 25.0  
KEY: radical equation | word problem | problem solving | Division Property of Square Roots

15. ANS: C  PTS: 1  DIF: L4  REF: 10-3 Operations With Radical Expressions  
OBJ: 10-3.2 Simplifying Products and Quotients  STA: CA A1 2.0 | CA A1 25.0  
KEY: Pythagorean Theorem | radical expressions | Multiplication Property of Square Roots

16. ANS: B  PTS: 1  DIF: L2  REF: 10-4 Solving Radical Equations  
OBJ: 10-4.1 Solving Radical Equations  STA: CA A1 2.0 | CA A1 25.2  
TOP: 10-4 Example 1  KEY: radical | radical equation | solving equations

17. ANS: D  PTS: 1  DIF: L2  REF: 10-4 Solving Radical Equations  
OBJ: 10-4.1 Solving Radical Equations  STA: CA A1 2.0 | CA A1 25.2  
TOP: 10-4 Example 1  KEY: radical | radical equation | solving equations

18. ANS: D  PTS: 1  DIF: L2  REF: 10-4 Solving Radical Equations  
OBJ: 10-4.1 Solving Radical Equations  STA: CA A1 2.0 | CA A1 25.2  
TOP: 10-4 Example 2  KEY: radical | radical equation | solving equations | word problem | problem solving

19. ANS: A  PTS: 1  DIF: L2  REF: 10-4 Solving Radical Equations  
OBJ: 10-4.2 Solving Equations With Extraneous Solutions  STA: CA A1 2.0 | CA A1 25.2  
TOP: 10-4 Example 4  KEY: solving equations | radical equation | extraneous solutions

20. ANS: D  PTS: 1  DIF: L3  REF: 10-4 Solving Radical Equations  
OBJ: 10-4.1 Solving Radical Equations  STA: CA A1 2.0 | CA A1 25.2  
TOP: 10-4 Example 2  KEY: radical equation | word problem | problem solving

21. ANS: B  PTS: 1  DIF: L2  REF: 10-5 Graphing Square Root Functions  
OBJ: 10-5.1 Graphing Square Root Functions  STA: CA A1 17.0  
TOP: 10-5 Example 3  KEY: graphing | square root | radical expressions
SHORT ANSWER

22. ANS:
   a. 
   
<table>
<thead>
<tr>
<th>Week</th>
<th>Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53</td>
</tr>
<tr>
<td>2</td>
<td>64</td>
</tr>
<tr>
<td>3</td>
<td>73</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>87</td>
</tr>
</tbody>
</table>

   b. 

   c. about $100,000

PTS: 1  DIF: L3  REF: 10-5 Graphing Square Root Functions
OBJ: 10-5.1 Graphing Square Root Functions
STA: CA A1 17.0
TOP: 10-5 Example 3
KEY: graphing | square root | multi-part question | word problem | problem solving
ESSAY

23. ANS:


$$AC^2 + 1^2 = \left( \sqrt{17} \right)^2$$

$$AC^2 + 1 = 17$$

$$AC^2 + 1 - 1 = 17 - 1$$

$$AC^2 = 16$$

$$\sqrt{AC^2} = \sqrt{16}$$

$$AC^2 = 4$$

Find $x$.

$AB = 5 + 1$

$AB = 6$

$$x^2 = 4^2 + 6^2$$

$$x^2 = 16 + 36$$

$$x^2 = 52$$

$$\sqrt{x^2} = \sqrt{52}$$

$$x = \sqrt{4 \cdot 13}$$

$$x = 2 \sqrt{13}$$

[3] answer not in simplest radical form OR one computational error

[2] two computational errors

[1] more than two error OR wrong sides used in equations

PTS: 1    DIF: L4    REF: 10-2 The Pythagorean Theorem
OBJ: 10-2.1 Solving Problems Using the Pythagorean Theorem
STA: CA A1 2.0 | CA A1 24.2
KEY: Pythagorean Theorem | right triangle | radical expressions | extended response | rubric-based question
24. ANS:

\[
\left(2\sqrt{5} + 3\sqrt{7}\right)^2
= \left(2\sqrt{5} + 3\sqrt{7}\right)\left(2\sqrt{5} + 3\sqrt{7}\right) \quad \text{definition of square}
= 4\sqrt{25} + 12\sqrt{35} + 9\sqrt{49} \quad \text{Use Foil.}
= 4(5) + 12\sqrt{35} + 9(7) \quad \text{Combine like radicals.}
= 20 + 12\sqrt{35} + 63 \quad \text{Simplify } \sqrt{25} \text{ and } \sqrt{49}.
= 12\sqrt{35} + 83 \quad \text{Multiply.}
\]

[3] answer not in simplest radical form OR one computational error
[1] more than two errors OR wrong sides used in equations

PTS: 1  DIF: L3  REF: 10-3 Operations With Radical Expressions
OBJ: 10-3.2 Simplifying Products and Quotients  STA: CA A1 2.0 | CA A1 25.0
TOP: 10-3 Example 4
KEY: FOIL | radical expressions | extended response | rubric-based question
25. **ANS:**

\[
\sqrt{3x} - 1 = -4 \\
\sqrt{3x} = -4 + 1 \\
\sqrt{3x} = -3 \\
\left(\sqrt{3x}\right)^2 = (-3)^2 \\
3x = 9 \\
x = \frac{9}{3} \\
x = 3
\]

Check

\[
\sqrt{3x} - 1 = -4 \\
\sqrt{3(3)} - 1 = -4 \\
\sqrt{9} - 1 = -4 \\
3 - 1 = -4 \\
2 \neq -4
\]

\[
\sqrt{3x} - 1 = -4 \text{ has no solution}
\]

[3] no conclusion stated OR one computational error
[2] wrong procedure OR two computational errors
[1] no work shown OR more than two computational errors

PTS: 1  DIF: L3  REF: 10-4 Solving Radical Equations
OBJ: 10-4.2 Solving Equations With Extraneous Solutions  STA: CA A1 2.0 | CA A1 25.2
TOP: 10-4 Example 5
KEY: radical equation | extraneous solutions | solving equations | extended response | rubric-based question